



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

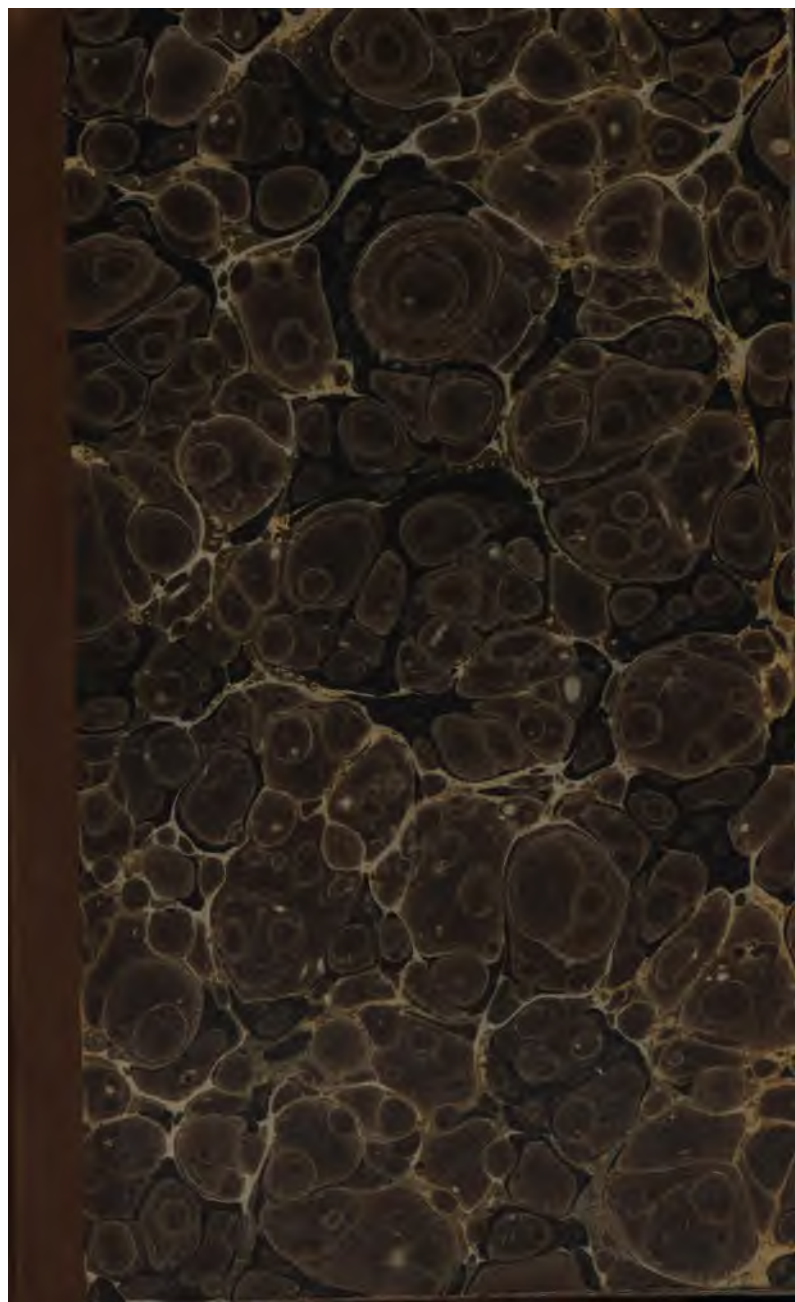
Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

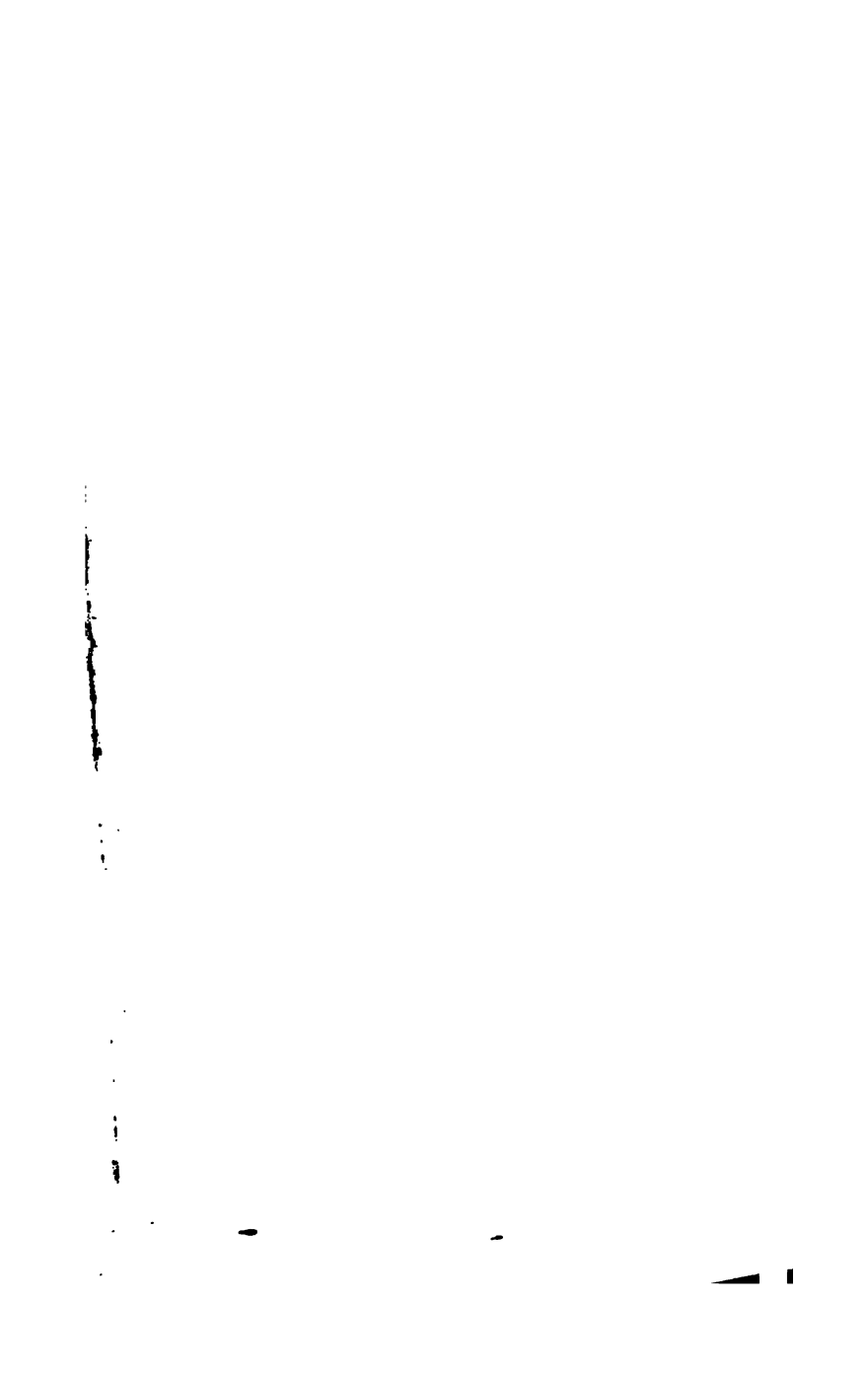
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



46.

1254.

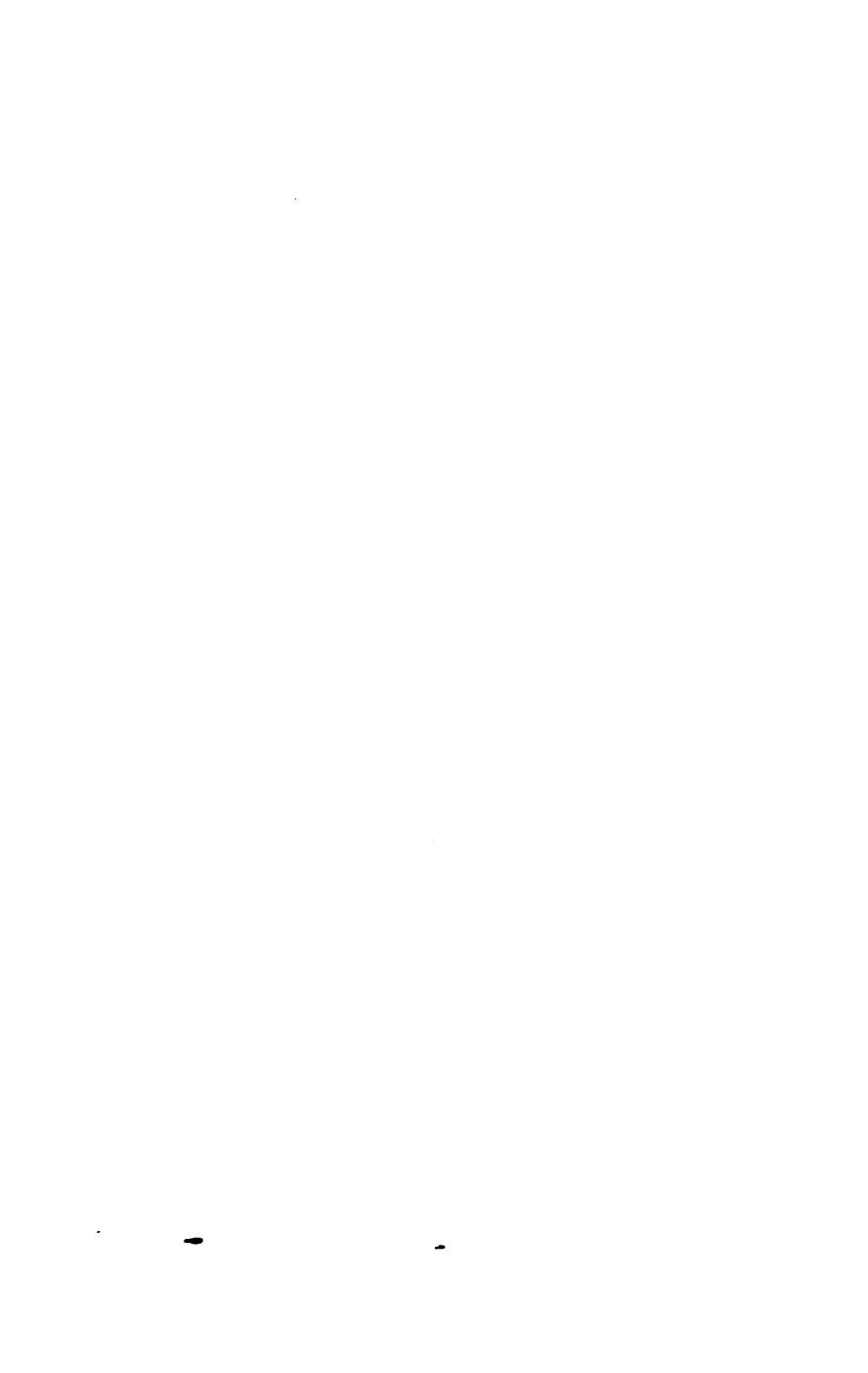




46.

1254.





THE
POTATO EPIDEMIC,
AND
ITS PROBABLE CONSEQUENCES;
A LETTER
TO
HIS GRACE THE DUKE OF LEINSTER,
AS PRESIDENT OF
THE ROYAL AGRICULTURAL IMPROVEMENT SOCIETY OF IRELAND.

BY
N. NIVEN,
LANDSCAPE GARDENER, GARDEN ARCHITECT, AND RURAL IMPROVER, ETC.



DUBLIN :
JAMES M^cGLASHAN, 21, D'OLIER-STREET
W. S. ORR AND CO., LONDON.

MDCCCXLVI.

1254.

Dublin : Printed by EDWARD BULL, 6, Bachelor's Walk.

THE
POTATO EPIDEMIC,

&c. &c.

TO HIS GRACE THE DUKE OF LEINSTER.

MY LORD DUKE,

The following statements relative to the Potato Epidemic, and its probable consequences, I have taken the liberty of addressing to your Grace, as President of the Royal Agricultural Improvement Society of Ireland.

That remarkable visitation, my lord, is a subject of no ordinary interest. It is one of deep and solemn import. The temporal welfare of millions is unquestionably closely and alarmingly connected with it. In Ireland, especially, it is well known how exclusively the people depend on the potato for their subsistence. The fact is, in many parts of the country they live upon little else ;—nothing but potatoes from day to day, from week to week, and even from year to year. Who, therefore, but must deeply deplore the present, not only ominous, but really dead and dying condition

of the crop ? From all I have lately seen, it appears one sweeping epidemic, from north to south, and from east to west. Neither are its ravages confined to those countries ; it is said to be universal, wherever the plant is in cultivation, even to its native Peru. It is undoubtedly an event of no common magnitude, and will, I humbly venture to predict, be found fraught with no ordinary results ; results, notwithstanding present unpromising appearances, that I am of opinion may ultimately be of incalculable advantage to the interests of the people in these lands.

That much local distress is to be expected from the enormous loss of the present year, is, I fear, more than likely ; but thanks to the Almighty Mover of every event, there are wondrous means in action to meet the otherwise depressing emergency, that ought greatly to cheer and brighten up the prospect before us. Most of these I shall endeavour to bring forward in their proper place, in this letter. Be these considerations, however, as they may, it is mine, and the duty of every member in the community, whilst we use every effort that time and means present to us, to meet the evil, at the same time humbly to bow, and leave results in the good hand of Him "who maketh the storm a calm"—who, though He sees meet to visit us with "blasting and mildew," yet is "gracious and merciful, slow to anger and of great kindness, and repenteth Him of the evil." It is ours

then, surely, under such circumstances, to be very deeply abased, and to acknowledge the mighty hand that smites us ;—nay, more, “to call a solemn assembly, to sanctify a fast ;” and then it might be that “the Lord would be jealous for the land, and pity His people”—yea, that He might say unto them, “Behold, I will send you corn, and wine, and oil, and ye shall be satisfied therewith.” From the Queen upon the throne, to the least among her numerous subjects, it well becomes every individual throughout her vast dominions to unite in humble acknowledgment that the present is, indeed, a direct judgment on our highly-favoured, beloved, but guilty country. It is, then, devoutly to be wished, that in every investigation connected with the calamity before us, this first of principles be recognized ; and then we may trust that the means used will be blessed, either as to the remedy or the substitute.

It is a remarkable feature of the case before us, my lord, that up to the present moment all human power, experience, and learning, has proved vain and futile, in the discovery of anything like an antidote, even in the way of mitigating or keeping in check the ravages of the disease ; every expounded expedient has failed, or, at best, proved but of trifling avail. Science, no doubt, has zealously done her best ; neither men nor means have been spared for the purpose. The dis-

secting-knife and microscope of the acute physiologist, the crucible and the analyses of the investigating chemist, have all, hitherto, been used in vain ; and now we are beginning to be convinced how impotent we are when we attempt to grapple with the workings of the Almighty.

In this introductory outset, I do, therefore, most humbly disclaim all idea of advancing anything in the way of prescriptive remedy ; from the very first outbreak of the disease, I despaired of it, nor do I anticipate that the cause is removeable by man. Evidences, I conceive, are strong and clear as to its atmospheric origin, and who can change the atmosphere ? But we are not without resources, neither may it be unimportant to trace up the remarkable workings of some of the diseases that have followed in the cultivation of the potato up to the present time ; this is all properly within our reach, and it is all I presume to do. What I advance, I wish to be understood as simply and solely the result of actual observation, and continued experiment ; theories, sometimes beautiful, are at best, but too apt to be baseless and false. I have therefore, renounced them in the present case as useless and unsatisfactory ; what I have to deal with are facts, and to form my conclusions accordingly.

From the nature of my professional duties, I have

had, throughout the whole course of the epidemic, ample opportunity of observation, in almost every part of the country; and when at home, the accident of my improving surface or garden farm here being in process of working, has enabled me to institute inquiries, and draw conclusions that, perhaps, few have had the same means of arriving at. I have, however, up to the present time, patiently refrained from any public notices thereon, until I should have had it in my power to submit results that otherwise would have been premature and incomplete.

With these preliminary remarks, I proceed to present the subject to your Grace and the public in the following order:—

First.—As to the remarkable failures of 1832, 1833, and 1834.

Second.—As to the character of the intervening crops, between 1834 and 1845.

Third.—As to the stages and progress of the epidemic in 1845.

Fourth.—As to the means used in securing a successful crop for 1846.

Fifth.—As to the stages and progress of the epidemic in 1846 (up to the time of writing).

Sixth.—As to the ultimate advantage that may be anticipated from a less extended cultivation of the potato.

Seventh.—As to the means in operation towards the

mitigation of the loss of the potato as a general crop this year.

Eighth.—As to the best attainable substitutes, in case of a total failure of the potato crop.

Ninth.—As to the most useful and profitable course of rotation to be pursued by the small holder, after the loss of the potato.

First, then, as to the failures of 1832, 1833, and 1834.

It was a remarkable circumstance that the “dry rot” failure, as it was then called, broke out almost simultaneously with the mysterious cholera; nor was it less remarkable that the virulence of the one died away soon after that of the other. That both proceeded from, or through the medium of atmospheric currents, there are numerous evidences which need not be recapitulated here, as they were publicly set forth at the time of these visitations. It is to be remarked, also, that the origin of the “dry rot disease” was in the *tuber*, not on the leaf, as is the case in the present epidemic; it likewise was chiefly developed in spring, at the time of planting; and was evidenced either by the blanks in the crop, or by the sickly, wiry-like stems that sometimes appeared from the infected root. In the present case, the development of the disease is towards the end of the summer, and during the autumn, and generally most destructive where the previous growth has been most luxuriant. The “dry

rot" or "root disease," prevented or destroyed the growth *upwards*; the "wet rot," or "leaf disease," destroys the growth *downwards*; thereby not only checking the maturation or swelling of the tubers, but also inducing, or rather *producing*, their premature decay.

But more than this. I must also mention that the *seedlings* I have had, both of 1845 and 1846, have been equally infected with the leaf disease, as have been the plants from the tubers; whereas the seedlings that I raised on the experimental ground, in the Royal Dublin Society's Botanic Gardens, at Glasnevin, in 1834, at the time I instituted my first experiments, were not at all infected with the root disease then prevalent; but were, without an exception, sound and perfect as could be desired. This, my lord, will be seen to be additional evidence that the apparent origin or seat of the diseases alluded to has been as I have stated: the one originating *in or from the tuber* early *in spring*, before the growth; the other *on or from the leaf*, in the course of the summer, but especially *in autumn*, seldom before, more often at, or immediately after, the full growth.

I have thus gone back to the periods above noted, for the purpose of carrying along with us, in the following pages, a recollection of these remarkable differences. But, further, on this section of the subject it is to be observed, that alarming as were the failures of 1832, 1833, and 1834, they soon afterwards passed away,

or became extremely partial; so also, in like manner, I think there may be entertained a hope that the present epidemic of 1845 and 1846, evidently arising from a corresponding cause, may gradually disappear, and the cultivation of the potato be again resumed, but upon better regulated principles for the general good.

Second.—As to the character of the intervening crops between 1834 and 1845.

From the time that the dry rot failure of 1832, 1833, and 1834, subsided, up to the close of 1844, the crops of potatoes have been generally abundant and remunerative, and also excellent in quality. In some instances even the quality of some varieties had considerably improved: witness that of the “cup.” It is true that, here and there, there were instances of partial failure; but these were usually to be accounted for, as arising from what may be called *common*, or *contingent* causes—as heating in the pit, and the like—causes at all times separate and apart from such as those I am now alluding to, but which have been, by many, speculated upon as solely productive of the epidemics in question. The crop of 1844 was throughout the country good, and prices, consequently, low. In Dublin, they rated from 1s. 10d. to 2s. 6d. per cwt. during the greater part of the season; whilst in many parts of the country, as in the county Roscommon, where I happened to be at the time, so low as from 1d. to 1½d. per stone. The crops of that year were healthy

and luxuriant to the last stage of their growth, and in storing, kept well; at planting-time, the following spring, there was not the smallest indication of anything like unusual disease: all was promising and hopeful, and a large breadth was put down.

Third.—As to the stages and progress of the epidemic in 1845.

It was about the latter end of July last year, that I first noticed the approach of the present disease. I had, amongst others, a remarkably promising crop of “cups,” about this time, in beautiful blossom. I had been for some weeks from home; and was, therefore, on my return, more minutely examining appearances than I otherwise might have done; when I observed on the edges of the leaflets of the variety named, on the *upper and under surface*, small brown specks here and there, certainly not larger than pin heads. I remarked to a person who happened to be with me at the time, “This is a very unusual appearance in the plant; it must be something new, and I must closely watch it.” Still the crop was most flourishing. After the lapse of about ten days, I again had an opportunity of examining the specks alluded to, when I found them enlarged to about the diameter of pencil heads; and on placing one under a medium magnifier, saw distinctly the workings of a minute parasitical fungus—called by botanists “*Botrytis infestans*,” in plainer terms, a species of mildew, and, like almost all other mildews, more or less destructive of the tissue or substance of

the leaf. On the external circumference of each spot, the woolly-like plant, was evidently rapidly spreading *outwards* over the whole surface or disc of the leaflet. In course of little more than a week, these blotches began to approximate, and here and there appeared on the foot stalks of the leaves, and even down on the wings of the stems. The next stage in the progress of this alarming work was, on examining the state of the tubers at the root, that an odd potato here and there was externally discoloured, and showing symptoms of decay: and these usually those *nearest the stem* or surface of the ground; and the *end* of the potato generally first affected was that *next to the cord* by which it is attached to the parent stem. So far did these observations go, up to the complete destruction of the leafy system of the plant. And here I would desire, my lord, to make some digressive remarks. We all know what an important part the *leaf* of the plant performs in the vegetable economy. The leaf principle may be considered as equivalent to the *life* of the plant, for without it, death is almost the invariable consequence. This being the case, what other result could we anticipate in the sudden destruction or prostration of the principle alluded to, but premature decay, disease, or otherwise rot, in the succulent and immatured tuber—a state of matter precisely suited to the spread of fungi? I conclude, then, that the so-called “rot” is a plain consequence arising from a self-evident cause. In no

case have I been able to detect rot at the root whilst the leaves and the stem were in vigour ; it was invariably *after the blotching had begun* ; and the one increasing below as to quantity, just in proportion to the increase of the other above. This, in my opinion, added to the foregoing, presents indubitable evidence that the disease originated, in the present case, in the leaf, and not in the tuber.*

I believe it has been urged in opposition to this, that because of a certain decay having been detected at the *bottom of the stem*, next to the root, and this previous to the blotching of the leaves, that therefore it must proceed from below. But this disease at the root I consider as apart altogether, and different from, the other ; it is one similar to that sometimes called "black leg," in the cruciferous or cabbage family, and is a decay, or cancerous-like drying up, of the external bark, at the bottom of the stem, and ultimately of the alburnous layer, or medium of circulation. The result of this in the potato, as in the family named, is, not blotching, but flagging of the leaves, as the first conse-

* Any one who at all understands the principles of animal or vegetable physiology must be aware of the fact, that all nature, air, earth, water, wood, and even stone, actually swarm with minute animal and vegetable life, of which, but for the microscope, we should have been almost ignorant ; and that those myriads of atomic life, be it spore, seed, or germ, only want the circumstances or predisposition suitable for their development, for good or for evil. They are a part—a little part—of the mighty magazine of the great "I Am." Well, then, may puny man exclaim, "How unsearchable are his judgments, and his ways past finding out !"

quence ; and then, a yellowing, or premature ripening, as the second. It may, in some cases, even be found accompanying the present epidemic, but more generally separate from it ; nor is it an uncommon circumstance that two diseases should be found acting at the same time on the same subject. In the present instance I think the two have been confounded. But to return ; about the beginning of September, 1845, I had the crop of said cup potatoes dug out, thinking it better to do this at once, with the loss of a few, than to risk, by leaving them in the ground till the usual time (October or November), the loss of all. Comparatively few were found diseased—certainly not more than one-twentieth. The produce was generally small in size, but of excellent quality ; and what were not of marketable dimensions I stored up for seed in narrow clamps or heaps, covering them simply with straw, and frequently turning and exposing them during winter to the full action of the air and weather. In this way they kept well, and I sold the most of them for seed at a high price this spring. My loss in this case was next to nothing.

Fourth.—As to the means used in securing a crop for 1846.

From what I had experienced in the *early portion* of my 1845 crop—having had it nearly all cleared out and sold off before the disease appeared to any extent in the country around, I determined on its appearance to stop short, run all risks, and endeavour to save a por-

tion of it for seed, for the crop of the next year—judging it possible that in the event of a return of the disease, it might again re-appear towards the end of the summer, or the turn of the day, as it then did, and that my best chance would be next year an *early crop*. In this conclusion, the result will show that I was right. To proceed—about the end of August, during some very hot days that then occurred, I had the reserved portion of my early potatoes dug out, and left basking for several days *in the sun's rays*; they were of very superior quality, and I may say, without one exception, free from disease. I then had the whole carefully picked up and put into small clamps or heaps in layers, with dryish soil between, and a slight covering of the same over them. For about a month or so they remained in this situation, when I had them all removed and ranged out in long narrow heaps—two feet, or so, wide at the base—on a shady bank of grass, somewhat elevated, to remain for the winter, and where no water could lodge; in this situation they were kept until the time of planting, which was in February, being covered only with straw and bass mats—the latter next the potatoes; and whenever a fine day occurred, the whole was turned off, and the potatoes exposed, for the entire day, to the full action of the weather;—by this means they were effectually *hardened and greened*. Nothing could exceed the plumpness and

soundness of the tubers so preserved. I should also add, that they, being so easy of access, could be the more easily watched, and could with facility be occasionally turned over, for the purpose of preventing growth in the bottom or centre of the heap ; by the beginning of February they showed a vigorous bud, when I had part sold, and the rest planted for my own experimental crop. I had this done by the spade in *narrow beds*, two and a-half feet in breadth only, leaving intermediate spaces between, of equal breadth, to be afterwards filled up by a drill of potatoes for seed, and with a *reserve crop* of mangel, to be ready to be transplanted in case of failure on the beds ; the whole of the beds thus planted, I had limed with a slight dressing of quick lime, just as they were breaking the ground ; they were immediately after this application shovelled, and the braird was as regular and strong as ever I had seen it in the same sort ; in the three feet spaces between the beds, I had an intermediate *drill of small potatoes sown for seed for 1847*. I then had my reserve crop of mangel put down on each side between the beds and the drills, a seed or two at every two feet apart ; this was all done at but little trouble or expense. Throughout the spring and early summer, all went on well, and by the time my potatoes were ready for the market, which was the 11th of June, the mangel plants were

sufficiently strong not to be much injured by the digging out of the crop in the beds, so I had them taken care of, and now, the end of August, I have a fair crop coming rapidly forward, with savoys in alternate lines, that were planted in middle of the potato beds between, and the leaves of them and the mangel are now meeting each other over the ground. The crop of potatoes in the early beds was of excellent quality, and for the season at which they were dug, of a fair and average size; there was not an instance through the whole of this crop of either blotching in the leaf or disease at the root. They returned me at the rate of £50 per statute acre. I may here further mention, as to the comparative advantages between autumn and spring planting of early potatoes (for I have carefully tested both), the result has been considerably in favour of *early spring* planting, namely, from the beginning to the middle of February. The reason will appear plain; about the time mentioned, the buds naturally begin to protrude, when it is easy to detect every unhealthy tuber, and lay them aside. In autumn planting this cannot so nicely be done. In early spring planting, the soil and the manure are loose and fresh, and their temperatures *rising*. In autumn planting, the temperature of air, soil, and manure is *falling*, the tuber thus rests inert until the time above-mentioned, when not only is the soil about it hard and soddened, but the

best parts of the manure washed away. Under present circumstances, for whatever seed there may be saved, the best advice I can give is to save as I have described, and plant as I have done, and not only would I recommend early planting of early potatoes, but an early planting also of later potatoes; all, in my opinion, should be planted in February, or, at least, the beginning of March. The early during the beginning—the late during the end of the month. As to the effects of liming, I am satisfied that it does no good as a preventive of the present disease, for I had it put over some pink-eye potatoes at the same time as the others I have mentioned above, and those I let remain until the disease again re-appeared, when I found them equally affected with the unlimed portions of the crop around them.

Fifth.—As to the stages and progress of the epidemic of the present year 1846 (up to the time of writing).

The portions of late potatoes I had planted this year were limited, for the reason I have given, to the few likely to be required by my own family, and, for experiment, they chiefly consisted of pink-eyes and cups; the growth and promise of these, up to within the last month, were even surpassing, in health and luxuriance, those of last year, when, about the middle of July, I again detected the ominous spot; it was precisely as before, in small

brown specks or blotches, chiefly on the leaves on the summits of the stalks. In one or two instances, I cut off these as they appeared a joint or two *below* the infected leaves. In the course of another week, the blotchings became more general, and the formerly sound leaves beneath on the excised stems, became affected also. But especially rapid was the destruction of the foliage after the heavy rains and thick fogs we had about the beginning of the present month (August.) At that time, too, the atmosphere was much charged with electric fluid, and it may be a question whether that subtle agent has not greatly conduced to the increase of such remarkable blight. It is also possible that the spores or minute seeds of the destructive *Botrytis* may have been deposited or conveyed through the medium of rains or fogs, the commencement of the spot or blotch when first observed being where the rain or dew-drop rests, on the margins of the leaves ; this idea forced itself upon me last year, but it is merely a supposition.

Having occasion, about the 17th of July, to be in the county of Louth, I observed at Barmeath, the seat of Sir Patrick Bellew, Bart., the first and most decided instance of the attack of the disease in question this year; even at that early period the tubers had become affected, and rapid decomposition was in progress. Since that time, it is too well known how fearful and rapid have been the ravages of the epidemic.

My *limed* pink-eyes, that were all sound and good when I began digging them in the end of July, in a few days began to show a few infected tubers—and each day after more and more,—until it became scarcely worth while digging them out of the ground; fortunately I had but few of them. The small early kidneys I sowed for seed between my reserve mangel lines, are, I find, tolerably safe, and I am determined to pursue the same method of keeping whatever seed I can save from them as I have already described as having done last year. Whilst I thus write, the fields around me, some of which a week or two back appeared exceedingly beautiful and promising, present now one brown incinerated surface; the stalks of the crops of “cups” are still in some instances green and succulent, and the tubers I have lately examined, though small in some cases, comparatively sound*—yet it is to be feared, judging from what I have stated, that decay will inevitably progress below, as the stem loses its substance above; few, it is greatly to be feared, and “far between,” will be the cases this season, where seed can be saved—and doubtless, my lord, wherever

* This morning, the crop alluded to is being dug out, and I have carefully examined the produce. The result is this: From tops that one would expect to yield fifteen or twenty tons per acre, there are produced only, of all sorts, large and small, sound and unsound, about four tons—one-third only fit for market, one-third nearly useless, and about one-third of small, rather plump, and promising potatoes; and these last are what I would have saved for seed. This is the precise state of this case of the “cup” crop.

it is possible, they will. Seed potatoes, we may rest assured, will be an article of great value and importance, next year.

Sixth.—As to the ultimate advantage that may be anticipated from a less extended cultivation of the potato.

Grievous, my Lord Duke, as it must verily be, for an Irishman to relinquish the cultivation of his favourite root, yet still he too must learn to adapt himself to circumstances, and take advantage, like other people, of other things placed within his reach; I have not a doubt, when once he has got over the difficulty of the transition state, he will have discovered how well it was he was so roused out of his lethargy and long cherished prejudices. That the cultivation of the potato has grown almost to a mania with him, there can be no doubt; on it he solely depends, as I have already hinted, for his subsistence; with it he feeds his meagre family; with it he feeds his grateful pig; and with the pigs he sometimes pays his reluctant rent; or otherwise, it may be, a few oats or wheat is grown, and these too, generally sold for the same purpose. It is seldom he attains to the possession of a cow—and as to butter or milk, it scarcely ever forms a part of his miserable meal; how soul and body, under such circumstances can really hold, for any length of time, together, is next to a miracle—in short it is scarcely possible for human beings to be worse off, than is the patient Irishman, with his

boggy walls and cheerless cabin; hitherto he has been satisfied with the potato, and the potato only—a root, however much to be desired as a *portion* of diet, certainly not conducive either to general health or vigour of constitution, when used exclusively for that purpose. No doubt the cultivation of the plant hitherto has been a matter comparatively easy and simple, and being so far suited to the habits of those who thus chose to be satisfied with it, the loss of it to them must be of no ordinary consideration. As to the comparative nutritional value of the potato, I believe I am correct when I state, that it is found to contain only about twenty-five per cent. of pure nutriment; whilst wheat contains so much as eighty-five, and barley eighty-three. If such be the case, what a difference is here! We also know the potato has qualities pertaining to it of an impure nature—in short, that the genus “*solanum*” is the actual type of a powerfully narcotic family. Such being the case, and valuable, no doubt, as the root in question really is, still we ought rather to desire the pure and more wholesome cereal food alluded to. That the constant absorption or assimilation into the animal system of this same nutritional ingredient, has been conducive to disease, I believe there is, amongst medical men, but one opinion—but more especially in unfavourable seasons, when the quality happened to be bad.

It may well seem strange, that rational and intelligent men, with heads upon their shoulders, and hands capable of working, should, by their indolence and want of common energy, have so long cheated themselves of even the common comforts of life. If such, then, is the fact, surely any move, however small, if in the right direction, from such an unmanly position, would be very desirable. And what, it may be asked, is "the right direction?" It is the application of a little more personal industry in the labouring of their own land, and a little more faithfulness and interest in labouring what is not their own; a more rational and productive system of tillage; and, to crown all, a better and more varied rotation of cropping; that is the direction in which I would wish to lead them. Nationally to effect this, however, human power, hitherto, with all its argument, and all its example, has been, in Ireland, with the exception of some few localities, unavailing and fruitless. But He who worketh not as man worketh—He who can, and who I am very sure will overrule the present calamity for good; has in his wisdom seen meet thus by other means to arouse from their supine torpor and inactivity those sleepy sons of indolence and misery; I cannot help here remembering the triteness and accuracy of the late notorious Cobbett, who so graphically dilated upon the potato as the "lazy root." That it engendered this unfortunate feature of character, however,

is to be doubted. That much and certain advantage will arise from the cultivation or substitution of other and more certain preparatory crops, I shall endeavour ere long to shew—crops not only more remunerative, but also more suited to the climate, and certainly much less expensive in the cultivation. Not that I would altogether exclude the culture of the potato, supposing that it should, as I trust it will, be spared to us ; by no means ; my argument and evidence are intended merely to show the benefit that would result from a *less general* dependence upon it, than has hitherto been the case in Ireland. It is most important, then, that the small holder, who has been especially so dependent upon the root in question for all things, should *now* be considering how best to occupy his potato-less ridges, and prepare for the coming season.

Seventh.—As to the consideration of the various means at present in operation towards the mitigation of the loss of the potato crop of this year.

In looking back over the year that is past, and remembering the very dark forebodings then held out, as to the want likely to arise from the failure at that time, and remembering the comparatively plentiful supply, even after all the loss that occurred, that there was of the potato, even up to the month of June last, I would anxiously hope that this year, more dark as the anticipations really are, the extreme want so much to be dreaded may, in like manner, fall considerably short of our fears.

The act of the Government of last year, in so promptly throwing supplies of foreign corn into the country at a cheap rate, just at the time when it was most needful, certainly greatly helped to meet the necessities of the people; and along with this, the large advances made both by means of local public subscriptions, and the amount of Government aid for the promotion of public works, contributed largely to the alleviation of the distress that did, to so large an extent, exist.

To meet the present anticipated destitution, it is surely very gratifying also, to see such early manifestations making by the present Government; and I doubt not that they, in their wisdom, will see the vast importance that does attach to the *principle* upon which this extraordinary compulsory improvement of the country—if I may so speak—should be conducted; and no doubt, your Grace, and all other interested landlords of the soil, will at once see how very much both of present and future advantage will arise to all concerned—labourer and landowner—if such labour and such improvements could be mainly identified with your respective properties, and by your several individual exertions; in other words, that the landlords should form the *main* relief army—the Government, with their public works, the *reserve*. Added to these is the commencement of so many lines of railroads in Ireland. This latter circumstance I

cannot touch upon without looking at it as a very striking interposition of Providence, on behalf of our hitherto unemployed and too generally badly paid population. What is the fact? At the very crisis of Ireland's sore distress, a field of employment and improvement is being opened up for her unemployed thousands, far exceeding any other means that could have been applied at such a time. It cannot be a mere accident: the same Almighty hand that chastises and corrects has, in His sovereign mercy, thus thrown in the blessing.

In either a moral or physical point of view, what benefit is more to be prized than an abundant demand for the investment of that capital which so contributes to a nation's strength and power—namely, its physical resources—its men, its women, and its children? And who dare venture to predict the sum total of individual advantage that is so likely to grow out of this most unprecedented revolution of things that now hangs over us?—Yes, who can tell? It is beyond the power of man to accurately estimate or foresee. Seeing, then, that such bright openings appear through the dark clouds that so overcast and darken our island horizon, let us be of good cheer, and each for himself arouse to vigorous effort, and exhibit to the world around, what are the characteristics of men and Britons. Let us, as a kindred people, cast to the winds those profitless and frightful animosities that have so long existed between

man and man—those party feelings and prejudices which so disgrace the fair face of this beauteous and much-neglected country. Yes, my lord, I would claim to say, Beloved countrymen, be aroused to useful exertion, and begin, at home, about your own neglected, and too frequently comfortless habitations, and you may depend upon it, so sure as I now write, the good result will soon show itself, and tell upon you—aye, if vigorously acted upon, and put into practice, before a short year goes round. And surely, oh, surely, what a soul-cheering feeling does this kindness to ourselves—this kindness to our neighbour produce in the breast of him who practises it! It is above all price—no jewel so bright—it is the treasure of which a man can never be robbed—it produces the happiness that arises from having done that which was right: do then, dear fellow-men, seek the possession of it; yea, seek it as it ought to be sought, at the beneficent hand of Him, without whose blessing our best efforts are nothing.

But as to the means towards mitigating the present impending evil, I am not yet done. We must not forget the opening of our ports at such a critical juncture for the almost unrestricted reception of foreign grain and other agricultural produce. Hopeful I am, my lord, that fearful as many were, and still are, as to the effect of this important legislative measure, that great and good results may, sooner than we

think of, proceed from it. But for it, what would our markets be at the present moment? Instead of reduced demand and unremunerative prices, I doubt not the farmer will find it much to his advantage; and this even should prices be otherwise than high; for he will be obliged to understand how to obtain a greater acreable quantity from his land than he is now obtaining, and that by the application of those improved principles of husbandry now so evident and plain; that is to say, instead of fifteen barrels of wheat per acre, he may have twenty, or even twenty-five—perhaps on to thirty; and so in like manner with almost every other crop. What is the fact? Not a fortnight ago, on a piece of medium land, in the county Dublin, I saw accidentally an instance of wheat cultivation, that I may mention in evidence. In this case, the wheat had been dibbled in, on drills made by the plough at fourteen inches apart, in the manner of turnip preparation. There were two and a half stone of seed only sown or dropped to the Irish acre, and what was the result? Such a crop as I never before witnessed—not even on the richest improved land of Lincolnshire. The crop, when I saw it, was in stook; and the produce of wheat was expected not to be much short of twenty barrels to the acre, which is equal to about eighty-four bushels; and I doubt not, judging from what I saw, it may not be much short of that quantity. Curiosity prompted me, when I was standing

in the field, to pull up the stubble of one plant or seed at my feet: I counted from it fourteen stems; and in a head, drawn from a neighbouring stook, fifty plump and perfect grains—thus presenting the enormous amount of seven hundred fold. Now here was a crop, greatly increased as to quantity—and how? Simply by reason of the way and *manner* in which the seeds were deposited in the ground—proper space, by this thin sowing, was given for a more perfect development of the plant, than can take place when the ordinary method of broad-cast or thick sowing is practised. Can anything be more simple and plain? Men—intelligent men must not be keeping their eyes longer shut; and if prices do very much fall, of necessity such methods of cultivation, as that I now mention, must be practised, or the business given up as a bad investment.

Blessed be God, we live in a country teeming with resources, and teeming, too, with a remarkable and extraordinary people (I speak of the three countries as a whole). We sometimes hear tell, my lord, of an overstocked population as the cause of many of our evils: there never was, in my opinion, a greater mistake. The land is, at least, capable of employing and maintaining triple the population we have; for if it is a fact, that every acre in cultivation is capable of producing, by a better and more improved system of tillage, at the lowest average, one-fourth more than it is

at present ; if every available acre of *improveable* waste land still in the country was brought into proper action, without at all including any of the questionable boggy surfaces ; and if, with this, capital was applied to tillage *as it ought to be*, and the green-cropping system more generally introduced, I am sure your Grace will agree with me when I say, that not only would there be thereby, an enormously-increased demand for profitable labour, but also, just in proportion, the means of comfortably maintaining a vastly-increased population.

Whenever I see those ships-full of able-bodied, weeping emigrants, who sometimes crowd our half-deserted quays, bidding their long, and perhaps, last adieu to their fatherland ; I could weep, too, over them, knowing the inert mass of wealth over which we are actually treading. Yes, my lord, it may justly be said, that a mine of yellow gold lies within little more than eighteen inches from the surface of our miserably tilled soil, that only wants the hands, and the means to move it ; and lo ! here are the strength and sinew of the people going off by thousands, to seek, after all, it may be, a doubtful subsistence in a strange and distant land. Depend upon it, these things are worthy of deep consideration, and the time, I think, has come for it. May a wise and energetic Government be enabled so to direct their means, as to apply in the most effective manner to

the still further development of the wondrous internal resources of these remarkable and highly favoured "islands of the sea." From what I have thus very briefly advanced, I have, I trust, made out a case of no common interest—something, I hope, to cheer and brighten up the present drooping spirits of a stricken and dejected population—enough, at least, to show in what direction the application of British capital will best tell upon the interests of our common country ; and it is plain, that with such means as those I have above alluded to, there ought not to be much fear as to results. For if employment, and ample employment, can be given, and the labourer receive, in money (no labourer, willing and fit, should have less than from eight to ten shillings per week, according to the present state of things), the means of purchasing what he requires for the subsistence of himself and family, he cannot be worse, but rather, I expect, better than he would have been with his too-cherished root, and *without* employment, as has been hitherto so much the case. The matter, I conceive, is plain and evident ; but how, it may be urged, is the Irishman to exist without the potato ? Just as the Irishman of other days existed before the time of good Sir Walter Raleigh, the reputed father of it. What ? are Irishmen so foolishly fastidious as to refuse to avail themselves of the rich and cheap grains of their own good colonies, and pout like spoiled children, because they cannot get their dear potatoes ? dear did

I say? never was word more truly said; the potato is, after all, one of the most expensive of cultivated plants, and but for the cheapness of labour in Ireland, and its use as a preparatory crop, would be *dear* indeed; but I digress. I believe a large supply of the *rough rice* of our West African colonies could be easily and profitably imported into this country, and retailed at, perhaps, not more than twopence or twopence halfpenny per pound, than with which most delicious and nutritious of grains there is scarcely any can compare. Now, what is the fact as regards this very rice? there it is, an article ready for use; take a pint of it, boil it, say, in three pints of water for about fifteen or twenty minutes until it is dry; you turn it out a beautiful prepared diet of what is called feathered rice, at the enormous cost of one penny farthing. Sprinkle on it, say one halfpenny worth of brown sugar or molasses (or milk when it can be had), and you have not only a delicious meal, but one of substantial nutriment, and all for the small cost of one penny and three farthings; and so with regard to the other meals in proportion, using a little cheap and good American beef or Russian bacon, as it may be, with the rice to dinner; and then, as for bread, half whole-meal of wheat, and half Indian corn meal mixed, and the food of the day will be effected for about the sum of little more than sixpence. It is to be hoped, that some of our great colonial London houses have, ere this, ample supplies of these rich

cereal grains on their way to Britain ; may the soft breezes of heaven soon bring their winged messengers of plenty to supply the want that is arising from our blasted fields, and may the good arrangements intended by the Government be promptly and speedily organized for the immediate employment of the people !

It may be mentioned that, at the present time, there are not, I learn, fewer than about 100,000 men already in good employment on railroad works, and at wages of from ten shillings to two pounds, and upwards, per week ; whilst there is a prospect, in the course of the ensuing year, of employment to the amount of 50,000 more ; so that, altogether, under the head of railroad operations alone, there may be employment for, at least, 150,000 men. It may be said, “ This is all very well ; but what is to become of all these men when the works are completed ? ” In answer, I would ask : Is it known to what an extent other sources of employment, contingent upon these very railroads, and our altered circumstances, as a manufacturing and agricultural people, will open up ? It assuredly is not known. It is marvellous, truly, my lord, with what accelerated speed we have been driven by the inventions and improvements of latter years, to our present position. How should our fathers, of even the last century, marvel, if they could get a glimpse of the empire as it now is ? In the short lapse of the

last twenty eventful years, we have, as a nation, made advances of the most extraordinary description ;—so much so, that I do verily believe it one of the most intricate of problems ever proposed : even an approximation as to what the probable results of such mighty changes may be, time alone can tell. For the present, let it be ours to be “girding up the loins,” and preparing for still greater events : we know not how close at hand they may be.

Eighth.—As to the best attainable substitutes, in case of a total failure of the potato crop of this year.

It may not be necessary for me to state how sensibly I feel the magnitude and importance of this interesting part of the subject before me. I desire, therefore, to approach the consideration of it, under a deep sense of the responsibility that must attach to any one who would venture to point the way to so large a mass of his fellow-creatures, particularly when it is in a direction differing from that to which they have been so long accustomed. Stern necessity, however, unwilling, doubtless, as many necessarily will be, may help me onward in the way ; and if I shall succeed, by these humble efforts, in helping them out of their present trying circumstances, however short a way, I shall have reaped a reward infinitely more gratifying than silver or gold.

The more simply to set forth my views on the pre-

sent head, I shall proceed to do so, my lord, in the way of question and answer, as the most concise.

1st.—What is it that will best supply to man the want of the potato?—It is bread, and bread it must be, in some shape or another—either wheaten altogether, or wheat and rye mixed, or rye alone, or oaten, or barley. These, according to the choice or circumstances of the individual, all good and wholesome, and of easy cultivation.

2nd.—What is it, amongst vegetables, that will be the most generally useful to the poor man, as assisting to make up for the loss of the potato?—It is the Swede, the parsnip, the carrot, and the cabbage, and I may safely add, that most excellent, productive, and easily grown root or tuber, the Jerusalem artichoke;—I dare say the true value of it will be found out by-and-bye;—all easily within the reach of those who have ground.

3rd.—What is it that will supply to the animal most useful to the poor man the want of the potato—I mean the pig?—It is the mangel-wurzel root, than which, in my opinion, no greater blessing could be presented to him for such a purpose, under present circumstances. It ought be his *main-stay* in the way of green feeding; and no poor man who has ground should be without it. For cows, as contributing to the improvement of their milk and butter, there is nothing better; poultry also feed on it. The leaves

come in in August, and the roots last till June. The best way for him of growing it is on beds, *like potatoes*. Sixty tons may easily be got from the Irish acre.

Thus far, my lord, as to what I consider the best substitutes for the potato.

Ninth.—As to the most useful and profitable course of rotation to be pursued by the small holder, after the loss of the potato.

I take the lowest probable subdivision of land—say from an Irish acre to ten. Well, there it is in the length and breadth of it; it may be good, it may be bad land. We take it as of medium quality, that is the general condition of things in this way. But what a picture does it present, my lord! how sadly it bespeaks the state of things within, aye, in the very man, its unfortunate and improvident holder,—its miserable cultivation, its broken and dilapidated fences, its enormous and unprofitable ditches, its irregularity and confusion, its filth: cases of holdings of an opposite description, are, I lament to say, in Ireland, of rare occurrence; for all that, I think they have of late years been getting better: but what a scope there is in it for the improving hand of industry and diligence, and what an amount of real advantage and comfort to the individual, and wealth to the country, would be the good management of these small holdings. I am one of those, my lord, who greatly doubt the correctness of small holdings being an evil. When in such condition as above described, no doubt

whatever they are ; and why ?—because they are in the hands of an exhausted and exhausting tenant ; but see them and consider them as they ought, and are to be found in the sister kingdoms—pictures of neatness, order, and regularity, rich in every useful produce ; and such is, I conceive, the legitimate grounds on which to consider them. I say, then, the more of those a country can present, the better, the more it tells as to the actual condition of things in that country ; it speaks of home, of happiness, and peace ; it indicates the spirit that breathes within ; as speaks the index of the mind in the man, so speaks the aspect and character of these holdings as to the state and condition of the rural population of that country. And if this be true, can they be held up as an evil ? Surely not. But it may be said, are they not productive of a pauper population ? No such thing, unless the people themselves are predisposed in that direction ; indolent habits alone, though with the means of remunerative employment, will, we know, produce pauperism ; but it seldom or never follows in the case of personal and domestic industry.

Whilst touching on the importance of the bearing of these small holdings, allow me, my lord, freely to express my sentiments relative to another, and not less interesting subject—I mean “ village allotments ;” for with it is most intimately connected the case of the poor neglected village labourer—the man who has

not, who cannot get, ground. Under the present circumstances of this country, I do conceive this highly deserving the consideration of the government. An investment of money could be effected in this way, so as not only to secure the payment of a fair interest, but also to establish a surplus fund for general repairs, or the further extension of the system ; and all the while, if properly conducted, it would still be an improving government property, worth its fair and full value at any time. Suppose, my Lord Duke, that in connexion with *every Irish village* there was, say five or more Irish acres of ground, purchased at a fair price ; and on this ground ten or more pair of *twin cottages*, each having its *separate* entrance and enclosure, well and substantially made ; and the whole of said surface properly drained and trenched, ready for the occupiers. Would not this, in the first instance, most usefully employ a large number of hands in every district in the country, and be effecting one of the finest national improvements, perhaps, that could be projected—an improvement not merely of temporary importance, as regards employment, but one of substantial and lasting benefit to that most useful but too neglected class of society—the hard-working labourers. To the most *deserving* only would I give the preference of obtaining such allotments ; and let them be held from year to year, at a fair, but moderate rent—no dispossession to take place so long

as such rent was *well and regularly paid*, and *conduct good*. See, my lord, what a stimulus would be here! Think how the industrious man could thus usefully and *interestedly* employ his idle time, when other day employment ran short; or fill up his spare morning or evening hours, as his own good sense might regulate. And could not, in connexion with such a system as this, small local horticultural societies be introduced, and premiums awarded, by proper and experienced judges, for the *best kept* allotments, and as well, for the best vegetables, or other productions—aye, too, for even the best pigs and poultry—and, likewise, the *cleanest houses*. They could go together in proper classes. How soon we should see the pretty dahlia, and the charming fuchsia raising their lovely heads. No fear of the pigs, my lord, if kept as they ought to be kept—not with the people, but in their own good and well devised sty. And surely these are no exaggerations. Does not even the worthy labourer deserve his flower, if he loves it as well as his more useful quadruped? Ah, yes, he does, my lord; and I know he can prize it, too. How well a few hundred thousands, advanced in this way, would tell! The moral influence of such bright and cheering spots, scattered thus over our sad and neglected country, in connexion with other extended employment, would soon, in my opinion, powerfully operate in diminishing the numbers in our district workhouses; and

whilst it is well, my lord, that the famous Drainage Bill should be in full and vigorous operation—not only giving employment to thousands, but effecting one of the most substantial agricultural improvements of modern times—namely, the widening and deepening of our principal sluggish streams—beginning, so to speak, at the right end of the work; yet still, withal, it might be well if, at the same time, something decided was done to substantially benefit the poor, but deserving labourer. And notwithstanding my complaint as to the native indolence, and the slovenly disposition of the great mass of these sons of toil, yet I well know there are thousands—aye, and tens of thousands amongst them, who only want the opportunity of showing what can be done, as to the improvement of these habits. In connexion with railroad improvements, much, no doubt, will be done in the above ways—I mean, as it relates to the introduction of *English habits of living and keeping*. Even now, on the Cashel line, we see neat ranges of comfortable cottages are being put up for the accommodation of these workmen. All this must do good, my lord, and the more we amalgamate the better.

I conclude by showing, in the following tabular form, what I would recommend as the most advantageous course of cropping for the parties alluded to; at the same time I would wish them to understand, that it is laid down as in connexion with house-

feeding, when a cow or cows are kept. Every small holder should be striving in his management to arrive at this result.

THE SMALL HOLDER'S CROPPING TABLE.

	DIVISION I.	DIVISION II.	DIVISION III.
First Year's Crop.	<i>Green Crops.</i> Mangel, Turnips, Parsnips, or Carrots.	<i>Soiling Crops.</i> Italian Rye Grass and Clover, Vetches, &c.	<i>White Crops.</i> Wheat, Oats, Barley, or Rye.*
Second Year's Crop.	<i>White Crops.</i> Wheat, Oats, Barley, or Rye.	<i>Green Crops.</i> Mangel, Turnip, Parsnip, or Carrots.	<i>Soiling Crops.</i> Italian Rye Grass and Clover, or Vetches.
Third Year's Crop.	<i>Soiling Crops.</i> Italian Rye Grass and Clover, or Vetches.	<i>White Crops.</i> Wheat, Oats, Barley, or Rye.	<i>Green Crops.</i> Mangel, Turnip, Parsnip, or Carrot.

As to the minor details connected with the tillage and working of these small holdings, there are various hints which I might give, that would be useful. These, however, not exactly pertaining to the object of this paper, I defer for some other opportunity.

* This may represent any supposed surface from one to ten acres.

GENERAL SUMMARY OF EVIDENCE.

CONCLUSIONS.

First.—That the earliest symptom of the epidemic is the deposition on the leaf, through the media of atmospheric cause, of a minute and destructive plant.

Second.—That the origin of the disease being thus on the leaf, its destruction thereby is more immediately the cause of the decay of the tuber.

Third.—That the epidemic is of a periodical character, not existing so much, if at all, during the spring and early summer, as during the end of summer and autumn.

Fourth.—That the disease being epidemical, and of atmospheric origin, we may be justified, from past experience of similar visitation, to hope for its gradual abatement.

Fifth.—That every possible care should be taken this year, to secure, by the method described, seed for next year, even though considerably tainted.

PROOFS.

Because the growth and extension of the parasitical plant, and its progressive destructive consequences, have been clearly and satisfactorily traced, almost from its original spore, as the immediate cause of the death or consumption of the leaf.

Because the leaf principle has been proved to be equivalent to the life of the plant, and therefore, its sudden destruction on the potato must be productive of corresponding consequences in the imperfect, watery, half-matured root.

Because the very early grown crops have generally escaped, whilst the late, or any portion of the early, left growing, has equally suffered, on the re-appearance of the epidemic—seedlings and all, without exception.

Because the former epidemic of 1832, 1833, and 1834, gradually subsided, and the plant has since been successfully cultivated.

Because as healthy plants have been obtained from diseased, or partially diseased tubers, as from apparently sound ones, both having been equally promising and luxuriant up to the time of the outbreak of the epidemic and both equally diseased afterwards.

ADVICE FOR CROP 1846.

INQUIRIES.

First.—Those who have either large or small breadths of the potato crop, inquire what is the simplest and most economical way of making the best use of the same?

DIRECTIONS.

Whenever there is any goodly proportion of the tubers comparatively sound, and the ground is not immediately required, and naturally dry, and the parties desirous of preserving such for eating or market use—let them remain where they are, and dig out as required. But, when the ground is required, let the crop be either dug, or ploughed out, and be it with the hand, spade, fork, or

INQUIRIES.

Second.—Those who have a total rot or loss of the crop; inquire whether the remains of such putrid crop, left or ploughed into the ground, will be likely to be injurious to the following crop.

DIRECTIONS.

harrow, spread on the surface; at once selecting the marketable, and selling them off; the rest left for several days to *harden*, by sun or weather. Then select the small sound ones for seed, and keep as directed. Then any fit for pigs or cattle, to be given to them, and all surplus so fit, to be steamed or baked in a pot, boiler, or oven, as picked up from day to day, and packed firmly into layers, in barrels, large boxes, or chests, and cased, or covered over with clay, or thick lime mortar, to exclude the air, and to be used for winter or spring feeding for either pigs, poultry, or cattle.

It is not at all likely that any damage will arise therefrom, any more than from other decomposing vegetable matter in the soil; but, from what is experienced, rather beneficial, as so much more vegetable manure; and, because the rot itself is not infectious, being only a final consequence of epidemical disease developed on the leaf and upper structures of the plant.

ADVICE FOR CROP 1847.

INSTRUCTIONS.

First.—To plant in February, or at latest March, as described, both early and late varieties, if to be got, or preserved.

Second.—To pull the stem, in all cases where the tubers are of any fair size, wherever the spotting on the leaf shows itself.

Third.—To plant either in alternate narrow beds, or drills, and introduce *reserve* crops of the Swedish turnip, or mangel wurzel, as choice may dictate, between, as described in the above letter.

REASONS.

Because in event of the return of the epidemic, it may again be towards the end of the season; and also because the very early crops so planted this year escaped, or nearly so.

Because by so doing (if done in time), the connexion between the diseased top, and what as yet may be the uninfected tuber, is cut off and separated.

Because, should the potato crop prove a failure, the extra spare plants at thinning, will profitably fill up the place of that crop.

Having thus, my Lord Duke, endeavoured, as briefly as possible, to submit to your Grace and the public these my several statements relative to the severe visitation in question, I trust that, notwithstanding all the imperfections necessarily attaching to such a dry detail of observation and practical results, that your Grace and they will at least give me credit for zeal and perseverance in thus having so far followed up, at my own expense and risk, my former experiments.

I have the honour to be,
My Lord Duke,
Your Grace's most obliged,
Obedient, humble Servant,

N. NIVEN.

Clontarf Lodge, Drumcondra, Dublin,
31st August, 1846.

P.S.—Should your Grace, any time before the clearing off of my green crops, in November, be pleased to honour me with a call here, in passing through Dublin, I shall have much pleasure, if at home, in showing you the matter-of-fact evidences of the cultivation alluded to in this letter, on what three short years back was one exhausted, neglected surface—literally one mass of noxious root-weeds. It had first been exhausted by successive white crops, and at length left to nature uncropped and untouched for two years.



